

GOVT. POLYTECHNIC, NAYAGARH
4TH SEMESTER MECHANICAL ENGINEERING 2025-26
LESSON PLAN

Subject- Th.2: Thermal Engineering-II

Name of Faculty: Abinas Nayak, Lecturer Stage I

Total Periods: - 45

Theory: - 3p/Week

Session: - 22/12/2025 to 18/04/2026

Sl. No.	Week	Period	Topics To Be Covered
1	1st	1 st	Unit-I: Air-standard Brayton cycle; Description with p-v and T-S diagrams.
		2 nd	Gas turbines Classification: open cycle and closed cycle; Comparison of gas turbine with reciprocating I.C. engines and steam turbines.
		3 rd	Applications and limitations of gas turbines; General lay-out of Open cycle constant pressure gas turbine.
Sl. No.	Week	Period	Topics To Be Covered
2	2nd	1 st	P-V and T-S diagrams and working of Open cycle gas turbine.
		2 nd	General lay-out of Closed cycle gas turbine; P-V and T-S diagrams and working.
		3 rd	Jet Propulsion: Principle of jet propulsion; Fuels used for jet propulsion; Applications of jet propulsion.
Sl. No.	Week	Period	Topics To Be Covered
3	3rd	1 st	Working of a turbojet engine; Principle of Ram effect; Working of a Ram jet engine.
		2 nd	Principle of Rocket propulsion; Working principle of a rocket engine.
		3 rd	Applications of rocket propulsion; Comparison of jet and rocket propulsions.
Sl. No.	Week	Period	Topics To Be Covered
4	4th	1 st	Unit-I Review / Numerical Discussion (Completion of 10 Hours Module).
		2 nd	Unit-II: Properties of Steam: Formation of steam under constant pressure; Industrial uses of steam; Basic definitions (saturated liquid/vapor line, regions).
		3 rd	Definitions: Critical point, saturation temp, sensible/latent heat, wet steam, dryness/wetness fraction, saturated/superheated steam, degree of superheat.
Sl. No.	Week	Period	Topics To Be Covered
5	5th	1 st	Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam using steam tables and Mollier chart.
		2 nd	Thermodynamic Processes: Isochoric process, Isobaric process (Analysis using steam tables/charts).
		3 rd	Thermodynamic Processes: Hyperbolic process, Isothermal process.
Sl. No.	Week	Period	Topics To Be Covered
6	6th	1 st	Thermodynamic Processes: Isentropic process, Throttling process, Polytropic process.
		2 nd	Simple direct problems on the above processes using tables and charts.
		3 rd	Steam calorimeters: Separating calorimeter, throttling calorimeter (Principles and Working).
Sl. No.	Week	Period	Topics To Be Covered
7	7th	1 st	Combined Separating and throttling calorimeters; Simple problems on calorimeters.
		2 nd	Unit-III: Steam Generators: Function and use; Classification with examples; Brief explanation of Cochran, Babcock and Wilcox Boilers.
		3 rd	Comparison of water tube and fire tube boilers; Modern high-pressure boilers: Lamont and Benson boilers (working & sketches).
Sl. No.	Week	Period	Topics To Be Covered
8	8th	1 st	Boiler mountings: Pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valves (dead weight, spring, high/low alarm).
		2 nd	Boiler accessories: Feed pump, economizer, super heater and air preheater.
		3 rd	Study of steam traps & separators; Explanation of terms: Actual evaporation, equivalent evaporation, factor of evaporation.

Sl. No.	Week	Period	Topics To Be Covered
9	9th	1 st	Boiler horsepower and boiler efficiency; Formula for the above terms without proof.
		2 nd	Simple direct problems on Boiler performance; Draught systems (Natural, forced & induced).
		3 rd	Unit-IV: Steam Nozzles: Flow of steam through nozzle; Velocity of steam at the exit of nozzle in terms of heat drop using analytical method.
Sl. No.	Week	Period	Topics To Be Covered
10	10th	1 st	Velocity of steam at exit using Mollier chart; Discharge of steam through nozzles.
		2 nd	Critical pressure ratio: Methods of calculation of cross-sectional areas at throat and exit for maximum discharge.
		3 rd	Calculation of cross-sectional areas (Numerical Problems).
Sl. No.	Week	Period	Topics To Be Covered
11	11th	1 st	Effect of friction in nozzles; Super saturated flow in nozzles.
		2 nd	Working steam jet injector.
		3 rd	Simple numerical problems on Steam Nozzles (Set 1).
Sl. No.	Week	Period	Topics To Be Covered
12	12th	1 st	Simple numerical problems on Steam Nozzles (Set 2).
		2 nd	Simple numerical problems on Steam Nozzles (Set 3).
		3 rd	Unit-V: Steam Turbines: Classification with examples; Difference between impulse & reaction turbines.
Sl. No.	Week	Period	Topics To Be Covered
13	13th	1 st	Principle of working of a simple De-Laval turbine with line diagrams- Velocity diagrams.
		2 nd	Expression for work done, axial thrust, tangential thrust, blade and diagram efficiency, stage efficiency, nozzle efficiency.
		3 rd	Methods of reducing rotor speed; Compounding for velocity, for pressure or both pressure and velocity.
Sl. No.	Week	Period	Topics To Be Covered
14	14th	1 st	Working principle with line diagram of a Parson's Reaction turbine; Velocity diagrams.
		2 nd	Simple problems on single stage impulse turbines (without blade friction).
		3 rd	Simple problems on reaction turbine including data on blade height.
Sl. No.	Week	Period	Topics To Be Covered
15	15th	1 st	Governing of steam turbines: Throttle, By-pass & Nozzle control governing.
		2 nd	Revision & Catch-up (Course Content Review).
		3 rd	Final Assessment / Doubt Clearing Session.

References:

1. **A Course in Thermal Engineering** - S. Domkundwar & C. P. Kothandaraman, Dhanpat Rai & Publication, New Delhi.
2. **Thermal Engineering** - R. K. Rajput, Laxmi Publication New Delhi.
3. **Thermal Engineering** - P. L. Ballaney, Khanna Publishers, 2002.
4. **Treatise on Heat Engineering in MKS and SI Units** - V. P. Vasandani & D.S. Kumar, Metropolitan Book Co. Pvt. Ltd, New Delhi.

Abinas
22/12/24
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